

Superfluorescence in photonic crystals studied by first-principle calculation

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Anomalous characteristics of superfluorescence in photonic crystals due to their peculiar photon density of states at the photonic band edge were first predicted by John and Quang [1]. Later we reported a numerical study of one-dimensional crystals based on the coupled-mode analysis and confirmed the non-integer exponents of atomic density dependence of the temporal profile of the emitted light pulses in the presence of the propagation effect [2, 3].

In this study, we generalize the previous treatment to the cases of (1) large refractive-index contrast, (2) three-dimensional crystals, (3) the presence of phase relaxation, and (4) inhomogeneous broadening.

[1] S. John and T. Quang, *Physical Review Letters*, **74**, 3419 (1995).

[2] K. Sakoda and J.W. Haus, *Physical Review A*, **68**, 053809 (2003).

[3] K. Sakoda, *Optical Properties of Photonic Crystals*, 2nd Ed. (Springer, Berlin, 2005) Chap. 11.